

Amphibians of Nepal: a few words of caution

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The recent multiplication of field guides to amphibians and reptiles for various countries of the world is appreciated by amateurs of these animals. Most of these books are of reasonable or small size, and mostly based on illustration, in particular good colour photos of animals. The heavy collective book on the amphibians and reptiles of Nepal edited by SCHLEICH & KÄSTLE (2002), however, is more ambitious, as it intends to provide detailed information on the taxonomy, distribution, biology, conservation, and relevance to humans of these animals. This book is clearly the result of an important collective work, it contains a lot of information, and nice illustrations. Whereas these photographs could have been used to prepare a well-illustrated small sized field guide, it is not quite clear however to which readers this expensive book is intended. Its size and weight make it difficult to use as a field guide. It includes many pieces of information which will be of little use to amateurs and tourists who just wish to identify species encountered during a journey to Nepal. But, more importantly and unfortunately the poor quality of part of this information and its unprofessional taxonomic background will make this book an unreliable and misleading reference for taxonomists and biologists in general.

The purpose of the present short review is not to document all the problems that may be encountered by future users of this work, but just to call attention to the existence of these problems through a few examples in the group of amphibians (reptiles won't be considered here). Despite the publication in the last three decades of several taxonomic revisions dealing with part of the amphibian groups occurring in Nepal, other groups are still awaiting such a work, and this should have been carried out before publication of a comprehensive book on this fauna. Time is certainly not ripe for the publication of a reliable scientific book on the frogs of Nepal, as well as of the surrounding countries (India, Sri Lanka etc.), or such a book should include so many question marks that it might have a debilitating effect on readers. Genuine taxonomic revision of the Nepalese frog fauna would have required re-examination of thousands of museum specimens worldwide, including all name-bearing types of names available for this fauna, and critical treatment of the synonyms of all these names (see DUBOIS, 2000b). This work remains for the future but should be done by rigorous and experienced taxonomists. The examples below are by no way exhaustive but are just meant at illustrating the kinds of problems encountered in the book. These casual notes taken during my rapid survey of the amphibian part of the book can be grouped in several categories:

TAXONOMIC PROBLEMS

SPECIES MISIDENTIFICATIONS

According to the photographs, drawings and descriptions provided, several species were misidentified by the authors of the book, most likely as a result of insufficient survey of the literature and absence of examination of relevant comparative material, in particular name bearing types. Various cases are conspicuous from the illustration provided, but quite likely many more cases remain, which casts a serious doubt on the identification of specimens on which lists of localities, distribution maps, biological observations and conservation proposals were based. In amphibians, several mistakes are serious as the misidentification is not only at the specific, but also generic or familial level.

The specimens referred to in this book as *Amolops monticola* (p. 212, 364) have nothing to do with this species and its group, but are similar to the type-specimens of the nominal species *Rana himalayana* Boulenger, 1888, whose status should be clarified, this group being still in need of revision (see below), but is either a synonym of *Amolops formosus* (Günther, 1876) or a closely related but distinct species *Amolops himalayanus* (Boulenger, 1888). On the other hand, the authors of the book clearly had in the hands specimens that belong to the species *Amolops monticola* (Anderson, 1871), but they described them (p. 336-337) and illustrated them (p. 381) under the name "Polypedates species, not identified", thus referred to the Rhacophoridae. The chapter dealing with the latter species does not even contain a detailed description of the species, and will therefore be of little use to future collectors of this species in Nepal.

Whereas the misidentifications listed above presumably concern all specimens referred to the species (species misidentifications), some other cases apparently concern a few specimens, especially those illustrated in figures (drawings and photos). Some figures were copied from other works but mistakes were introduced concerning the original identifications of the specimens: e.g., skull of *Paa spinosa* (fig. 4 p. 1096 in DUBOIS, 1975) shown under the name of *Paa lubign* (fig. 2 p. 273). Other doubtless specimen misidentifications concern original figures of the book, but, as no collection numbers are provided for the specimens shown in these figures, it may be difficult later to come back to these specimens and correct their identifications: e.g., *Fejervarya pietrei* under the name *Limnonectes tentensis* (fig. 52 p. 369), or *Chaparana sikimensis* under the name *Paa blanfordi* (fig. 2 p. 265, fig. 55-57 p. 370).

Some specimens illustrated in the book as "unidentified species" are doubtless representatives of well known species: those of "Bufo spec." on p. 355 are in part *B. himalayanus* (fig. 10) and in part *B. melanostictus* (fig. 11-12), the specimen of "Paa spec." on p. 374 cannot be assigned to a species on the basis of the photos as these do not show relevant characters for such an identification and no locality is provided, but they are likely to be simply specimens of *Paa hehigi*.

SAME SPECIES UNDER SEVERAL NAMES

A species of the subgenus *Rana* / *Silivana* has been recorded from the Terai plain of southern Nepal since 1974 (DUBOIS, 1974: 411). Pending a revision of the subgenus *Silivana* (which will soon appear but was long delayed because of the high number of available names, whose types are in various museums in the world), DUBOIS (1974) preferred not to create any name for this species, but to use for it the oldest available name for species of the subgenus, namely *Rana nigrovittata* Blyth, 1855. Despite advice (given to them in letter) not to do so, MITCHELL & ZUG (1995) used the name *Rana danieli* PILLAI & CHANDA, 1977 for 3 specimens of this species from Terai, although the original description of the latter clearly did not apply to this species. Having examined these 3 specimens, DAS (1998) established for them the name *Rana chitwanensis*. Whatever the status of the latter name (which will be dealt with in our forthcoming revision of the subgenus), it is quite clear that the names *Rana nigrovittata*, *Rana danieli* and *Rana chitwanensis* applied in the past to Nepalese specimens referred to a single species. Although the authors of the book had suspicions about this, rather than trying to solve this taxonomic problem (which seems inescapable when preparing a book of this kind), they included both species *R. chitwanensis* and *R. nigrovittata* in the book, in two distinct chapters (p. 291 sq., 295 sq., 375).

The same situation concerns the genus *Sphaerotheca*, for which the book lists not less than 4 valid species names (p. 301-316, 376-378), although DUBOIS (1983, 1999, 2000b) had repeatedly stated that at least 3 of them (*S. breviceps*, *S. maskeyi*, *S. swani*) are invalid, and refer to a single species that should be known as *Sphaerotheca pluvialis* (Jerdon, 1853), but that shows a striking coloration polymorphism. Of course, the authors of the book are free to disagree with this synonymy, but then they should provide critical comparative data (e.g., morphometric, bioacoustic or molecular) supporting their interpretation. As for the fourth species, *Sphaerotheca rolandae*, it is indeed a distinct species known to occur in Sri Lanka and southern India, but its occurrence in Nepal still needs confirmation on the basis of voucher specimens examined by competent taxonomists.

OBSCURE GENERIC TAXONOMY

In some cases, the authors did not follow recent works for the generic allocation of species. Here also, this could be a justified choice if arguments were provided to support it, but simple ignorance of recent works has no justifiability. Thus, the four species allocated in this book to the genus *Limnocytes* FITZINGER, 1843 (p. 243) are now placed by all recent authors (DUBOIS & OHLER, 2000; VEITH et al., 2001; KOSTICH et al., 2001, etc.) in the genus *Fekervarya*, which is now considered to be a member of a clade distinct from that of *Limnocytes*.

OTHER UNSUPPORTED TAXONOMIC DECISIONS

A number of taxonomic changes are proposed in this book, but unsupported by any scientific evidence (e.g., new morphological, morphometric, bioacoustic, karological or molecular evidence). Thus, on the basis of a statistical morphometric analysis of a very small sample, DUBOIS (1974) tentatively synonymised the name *Rana humulaviana* Boulenger, 1888 with the name *Polypedates formosus* Günther, 1876. The two names are based on type specimens with rather different colorations (dull olive green or brown vs. bright green) and might indeed apply to different species, but this should be documented. In the book, they are regarded as distinct (although the first one under the name *Amolops monticola*, see above), but no analysis is provided to support this taxonomic decision. Similarly, DUBOIS (2000b, 333), after examination of its holotype, considered the name *Amolops nepalicus* Yang, 1991 as synonymous with *Amolops marmoratus* (Blyth, 1855) but in this case he did not publish detailed information in this respect. Treatment of the former name as valid in the book (p. 214), based on the single holotype, is unsupported by any critical comparative study of the two "species".

SPECIFIC SYNONYMS

Like in other recent publications (see e.g. DUBOIS, 1998b), the information given under the heading "synonyms" is not a proper synonymy but a partial chresonymy (see DUBOIS, 2000a), as it is often wrong or/and incomplete: it may include a mixture of genuine and wrong synonyms, of new combinations and of "references" either correctly or incorrectly attached to the species. These "synonyms" are therefore unreliable sources of information. Examples of fully inexact synonyms are that of *Hoplobatrachus tigerinus*, that includes several names which refer to nominal species belonging in the genera *Fekervarya* and *Sphaerotheca* (DUBOIS, 1984, 2000b) or that of *Rana*, *S. liviana* *meristitata* (p. 295), that includes the name *Rana tyleri* Boulenger, 1882, a member of the subgenus *Hikarana*, not *Silivana* (OHLER & MALLICK, 2002). An example of incomplete synonymy is that of the name *Scutiger nungonensis* Fei, 1977, that should include the name *Scutiger occidentalis* Dubois, 1977, synonymised with the former by DUBOIS (1987: 19): if the latter synonymy is not accepted, then only the second of these names, not the first one, should appear in this book. An example of wrong chresonym quotations is given by the name *Megophrys monticola* Kuhl & Van Hasselt, 1822, listed in the synonymy of *Megophrys parva* (p. 164) although it refers to a distinct biological species from Java, now known as *Megophrys montana* Kuhl & Van Hasselt, 1822 (DUBOIS, 1982). Uncritical copy of complete long synonymies from old and unreliable books, like that of AHL (1931) for the species of Rhacophoridae (p. 317 sq.), can only contribute to disseminate obsolete and inexact information, being of no use to recent non-taxonomists who will use this book without having the background necessary to correct these mistakes.

UNSATISFACTORY DESCRIPTIONS

Many examples could be mentioned here, but let us just point to a striking one. The tadpoles of the genus *Hoplobatrachus* are unique among all ranoid tadpoles in the world in their exhibiting double rows of keratodonts on lips (DUBOIS, 1992), and this striking character was among the facts that pointed to the unique distribution of this genus in Africa and Asia (KOSUCH et al., 2001, GROSJEAN et al., 2004). This character is fully ignored in the descriptions of the tadpoles of *H. crassus* (p. 233) and *H. tigerinus* (p. 241).

MISSING BASIC TAXONOMIC INFORMATION

Despite the ambition and weight of the book, the following basic taxonomic information is missing: authors, dates and synonymies of family-group and genus-group names, type-species of genera with their modes of designations, synonymies of generic names, name-bearing types of valid and invalid (synonymous, homonymous) specific names, with their modes of designation and major characteristics (sex, size, condition). A crucial information for any professional taxonomic work is to provide a detailed list of material examined for taxonomic accounts and descriptions, and of voucher specimens on which distributional data and maps are based. This is completely absent from this book. Which name-bearing types have been examined by the authors is not stated. Long lists of localities are provided for all species (p. 1044-1069), but without any collection numbers for the specimens given the high rate of misidentifications in the book, no confidence can be placed on the taxonomic allocations of the specimens, and therefore all distribution maps in the book are doubtful. The authors compiled a comprehensive list of localities (p. 1069-1077) which will certainly prove very useful, but could have been more so, especially to place these localities on map, if it included the district, latitude and longitude of all identified localities.

NOMENCLATURAL PROBLEMS

INVALID NAMES AND SPELLINGS

Several species are provided with invalid names or spellings. Some are due to unjustified emendations of names: thus, whereas it is true that the generic name *Uperodon* is masculine in gender, not neuter, this does not imply a change in the spelling of the specific name of *Uperodon s1 stoma* (Schneider, 1799), which is invariable, being an epithet in apposition based on the Greek term *stoma* (mouth), that should not be emended into *s1 stomus* (p. 198). The book contains phantastic, sometimes quite funny, statements regarding the etymology of names, like the suggestion that the generic name *Amolops* (created by COPE, 1865: 117) is derived from the generic name *Amo* (created by DUBOIS, 1992: 321), or wrong statements on the identities of persons to whom taxa were dedicated (e.g., *Fejervarya pierret* p. 747) or on the meaning of geographical terms (e.g., *Fejervarya s1 hadrensis*, p. 249).

AUTHORSHIP AND DATE

Particularly striking as an example of unprofessional taxonomic work is the case of the name *Pala rartea*. This name was proposed by DUBOIS et al. (2001a) as a new replacement name (nomen novum) for the preoccupied name *Rana rana* Dubois & Matsui, 1983. In zoological nomenclature, the author of a nomen novum is the person who published this new name, not the author of the replaced name, so in this case the valid name of the taxon is *Pala rartea* Dubois, Matsui & Ohler, 2001, not *Pala rartea* (Dubois & Matsui, 1983).

OTHER PROBLEMS

UNSUPPORTED CONSERVATION BIOLOGY STATEMENTS

Statements and decisions in conservation biology are meaningful and efficient only if based on serious and solid taxonomic, distributional and ecological data (DUBOIS, 2000b, 2003) This is well exemplified in this book: the statement that the species *Sphaerotheca swani* is "endemic for Nepal" and should be given the status "S (susceptible)" is misleading as no such species exists, the name *swani* being a synonym of *phialis* (see above), a species that is not particularly threatened in Nepal

OTHER INCORRECT INFORMATION

Some statements concerning biological facts are wrong. Thus, the very striking yellow coloration of *Hoplobatrachus tigerinus* shown in fig. 51 of p. 368 is typical of these frogs when they just go out of their subterranean shelters on the occasion of the first rains at the end of the dry season, just before breeding, and has nothing to do with "stress e.g. in transport bags"!

A HEAVY TENDENCY

Quite unfortunately, the problems pointed out above are not unique to this book, although they are particularly conspicuous here. In the recent decades, a heavy tendency towards publication of unreliable papers and books in the field of taxonomy has clearly developed, which allows to speak of a "crisis of taxonomic research" (DUBOIS, 2003). This is largely due to the progressive rejection of taxonomy outside the field of scientific research in many academic institutions and publications, which leaves the field more and more in the hands of unprofessional actors. In amphibians, a strong difference now exists between a rather limited number of taxonomic publications of high or very high quality, and a number of other works that show a very uneven taxonomic expertise. This lack of expertise can be expressed in various ways (see a list of examples e.g. in DUBOIS, 2003), including the recent multiplication of descriptions of "new species" without proper comparisons with already known species, without examination of relevant name-bearing types and even without proper consideration given to existing names, "hidden in synonymies" (see e.g. DUBOIS & ÖHLER, 1995). In South Asian frogs, another recent tendency, which seems quite opposite but is also a consequence of the current disaffection for taxonomy in science, is to announce noisily the discovery of many new, "to-be-described" species (DITTA & MANAMENDRA ARACHCHI, 1996; PUTHYAGODA & MANAMENDRA-ARACHCHI, 1998; BIJU, 2002; MEGASKUMBI RA et al., 2002a, b; PINNISI, 2002), on the basis of gross morphological information and sometimes molecular data, but without publishing detailed taxonomic revision of the groups concerned, including relevant taxonomic comparisons and discussions, nomenclatural review, characterization, diagnosis and formal descriptions of new species. Problems are also encountered at levels above the species, with two extreme attitudes: one refusing any novelty to maintain "stability" of the old, traditional generic taxonomy (e.g. INGER, 1996), and another one consisting in introducing a new generic taxonomy without even proposing a diagnosis or description for the "new genera" (e.g. BAHIR et al., 2002; MEGASKUMBI RA et al., 2002b). In both cases, what is at stake is the absence of a proper reflection on the genus concept, or at least of explicit statements about what the authors understand under the taxonomic category of genus, which is much less "self-speaking" and simple as it may seem at first sight (see DUBOIS, 1987, 1988).

Let us consider in more detail the case of the genus *Pseudophilautus*, whose "resurrection" was proposed by BAHIR et al. (2002) and MEGASKUMBI RA et al. (2002b) on the basis of the cladogram published by MEGASKUMBI RA et al. (2002a) despite the only partial resolution of the latter. Even if supported by cladistic data, recognition of two distinct genera (*Philautus* Gistel, 1848 in South-East Asia, and *Pseudophilautus* Laurent, 1943 in South Asia) for the two clades suggested by the cladogram would still require a serious discussion of the genus concept and additional data, including taxonomic diagnoses of the "new genera", to become convincing. Evidence is still lacking for the relationships between the northern Indian and Himalayan species of *Philautus* on one hand, and the Sri Lankan and south Indian species on the other, as well as with the Indonesian and Indonesian species of this group, so that it is not yet clear which species should be included in a well-defined genus including the south Asian

ones. Once characterised, this genus would need a serious revision, which will not be an easy task as most of these extremely poorly known frogs are small, very similar and have similar calls. Any serious revision of this genus will require first the recognition and definition of species-groups within this large assemblage, then proper establishment of the characteristics (morphological, morphometrical, genetic, bio-acoustic, ethological, ecological) of all species within each of these groups, then comparisons with all name-bearing types of nominal species that might be conspecific with them, and finally describing, diagnosing, keying and naming all these species. Although the recent completion of a complete nomenclatural review of all names available for these frogs (BOSSUYT & DUBOIS, 2001) will no doubt facilitate this work, the latter remains a heavy task. The previous groups recognized within this assemblage, either as subgenera (DUBOIS, 1987) or as species-groups (DRING, 1987; FEI, 1999) are not satisfying, as they only were based on examination of part of the species of the genus. Even if few external morphological characters are available for recognition of groups within this assemblage, it is likely that anatomical (muscular, skeletal) characters could provide better clues, and that even more useful information could be obtained by recognizing "shape groups" through morphometrical methods, a course that has already given excellent results in several anuran groups (OHLER & DUBOIS, 1999; DUBOIS et al., 2001b; and references therein).

Should the current trend identified above continue and strengthen in the future, we might have to see more and more publications, particularly in fields like evolutionary theory or conservation biology, dealing only with "numbers of species", or with species only characterised by a few molecular characters, without being properly described, diagnosed and named. This would indeed be a strong historical regression to the earlier days of taxonomy, when authors just "announced" and named "preliminary" their new species and briefly indicated their characters, pending more detailed works which in fact were never subsequently published, whereas in the last decades major progresses have been made in the methodology of taxonomic research, and much higher standards have become usual in serious taxonomic publications. The responsibility of editors and referees of zoological journals and book series, in accepting publication of such works, is strong. Among the consequences of this poor taxonomic background, unreliable statements regarding phylogeny, species distributions and conservation biology are more and more often published (see e.g. DUBOIS, 1998a-b), which is particularly worrying at the beginning of the "century of extinctions": if based on inexact taxonomic and distributional data, conservation decisions and actions may be completely irrelevant and inefficient. Time may have come for competent taxonomists to speak louder in favour of their discipline, in particular to ask for a better editorial work on manuscripts of papers submitted to zoological journals and on books proposed to editorial companies. A way to obtain such a result would be to suggest the inclusion of editors for taxonomy and nomenclature in editorial boards, as competence in other fields of biology (including evolution, phylogeny or biogeography) does not imply by itself competence in taxonomy and nomenclature, which requires a specific training and culture.

LITERATURE CITED

- AHL, E., 1931. - Anura III. Polydactylidae. *Das Tierreich*, **55**: i-xvi + 1-477.
- ANDERSON, J., 1871. - A list of the reptilian accession to the Indian Museum. CALCUTTA, from 1865 to 1870, with a description of some new species. *J. asiat. Soc. Bengal*, **40**: 12-39.
- BAHR, M., MEEGASKUMBURA, M., PETHIYAGODA, R., MANAMENDRA-ARACHCHI, K., & SCHNEIDER, C. J., 2002b. - Reproduction in captivity of four species of direct-developing frogs from Sri Lanka (Anura: Ranidae: Rhacophorinae: *Pseudophilautus*). *Frog Leg.* **10**: 9.
- BIJU, S. D., 2002. - A synopsis to the frog fauna of the Western Ghats, India. Occasional Publication, Indian Society for Conservation Biology: 1-24.
- BOSSUYT, F. & DUBOIS, A., 2001. - A review of the frog genus *Philautus* Gistel, 1848 (Amphibia, Anura, Ranidae, Rhacophorinae). *Zeylanica*, **6** (1): 1-112.
- COPE, E. D., 1865. - Sketch of the primary groups of Batrachia Salientia. *Nat. Hist. Rev.* (n.s.), **5** (17): 97-120.
- DAS, L., 1998. - A new species of *Rana* from the Terai of Nepal. *J. Herp.*, **32** (2): 223-229.
- DRING, J., 1987. - Bornean treefrogs of the genus *Philautus* (Rhacophoridae). *Amphibia-Reptilia*, **8** (1): 19-47.
- DUBOIS, A., 1974. - Liste commentée d'Amphibiens récoltés au Népal. *Bull. Mus. nat. Hist. nat.*, (3), **213** (Zool.143): 341-411.

- 1975. – Un nouveau sous-genre (*Paa*) et trois nouvelles espèces du genre *Rana*. Remarques sur la phylogénie des Ranidés (Amphibiens, Anoures). *Bull. Mus. natn. Hist. nat.*, (3), **324** (Zool. 231): 1093-1115.
- 1982. – Le statut nomenclatural des noms génériques d'Amphibiens créés par Kuhl & Van Hasselt (1822): *Megophrys*, *Oecidozyga* et *Rhacophorus*. *Bull. Mus. natn. Hist. nat.*, (4), **4** (A): 261-280.
- 1983. – Note préliminaire sur le groupe de *Rana* (*Tomopterna*) *breviceps* Schneider, 1799 (Amphibiens, Anoures), avec diagnose d'une sous-espèce nouvelle de Ceylan. *Alytes*, **2** (4): 163-170.
- 1984. – Note préliminaire sur le groupe de *Rana limnocharis* Gravenhorst, 1829 (Amphibiens, Anoures). *Alytes*, **3** (4): 143-159.
- 1987. – Miscellanea taxinomica batrachologica (I). *Alytes*, **5** (1-2): 7-95.
- 1988. – The genus in zoology: a contribution to the theory of evolutionary systematics. *Mém. Mus. natn. Hist. nat.*, (A), **140**: 1-123.
- 1992. – Notes sur la classification des Ranidae (Amphibiens, Anoures). *Bull. Soc. linn. Lyon*, **61** (10): 305-352.
- 1998a. – List of European species of amphibians and reptiles: will we soon be reaching "stability"? *Amphibia-Reptilia*, **19** (1): 1-28.
- 1998b. – Mapping European amphibians and reptiles: collective inquiry and scientific methodology. *Alytes*, **15** (4): 176-204.
- 1999. – South Asian Amphibia: a new frontier for taxonomists. Invited editorial / Book review. *J. South Asian nat. Hist.*, **4** (1): 1-11.
- 2000a. – Synonymies and related lists in zoology: general proposals, with examples in herpetology. *Dumerilia*, **4** (2): 33-98.
- 2000b. – The influence of man on the distribution of amphibians in the Himalayas of Nepal: an example of critical evaluation of biogeographical data. In: G. MIEHE & Y. ZHANG (ed.), *Environmental changes in high Asia*, *Marburger geogr. Schriften*, **135**: 326-345.
- 2003. – The relationships between taxonomy and conservation biology in the century of extinctions. *Comptes rendus Biologies*, **326** (suppl. 1): S9-S21.
- DUBOIS, A., MATSUI, M. & OHLER, A., 2001a. – A replacement name for *Rana* (*Paa*) *rara* Dubois & Matsui, 1983 (Amphibia, Anura, Ranidae, Raninae). *Alytes*, **19** (1): 2-4.
- DUBOIS, A. & OHLER, A., 1995. – Frogs of the subgenus *Pelophylax* (Amphibia, Anura, genus *Rana*): a catalogue of available and valid scientific names, with comments on name-bearing types, complete synonymies, proposed common names, and maps showing all type localities. *Zool. Polon.*, "1994", **39** (3-4): 139-204.
- 2000. – Systematics of *Fejervarya limnocharis* (Gravenhorst, 1829) (Amphibia, Anura, Ranidae) and related species. 1. Nomenclatural status and type-specimens of the nominal species *Rana limnocharis* Gravenhorst, 1829. *Alytes*, **18** (1-2): 15-50.
- DUBOIS, A., OHLER, A. & BIJU, S. D., 2001b. – A new genus and species of Ranidae (Amphibia, Anura) from south-western India. *Alytes*, **19** (2-4): 53-79.
- DUTTA, S. K. & MANAMENDRA-ARACHCHI, K., 1996. – *The amphibian fauna of Sri Lanka*. Colombo, Wildlife Heritage Trust of Sri Lanka: 1-232.
- FUJ, L. (ed.), 1999. – *Atlas of amphibians of China*. Zhengzhou (China), Henan Press of Science and Technology: [i-ii] + 1-432. [In Chinese.]
- GROSJEAN, S., VENCES, M. & DUBOIS, A., 2004. – Evolutionary significance of oral morphology in the carnivorous tadpoles of tiger frogs, genus *Hoplobatrachus* (Ranidae). *Biol. J. Linn. Soc.*, **81**: 171-181.
- INGER, R. F., 1996. – Commentary on a proposed classification of the family Ranidae. *Herpetologica*, **52** (2): 241-246.
- KOSUCH, J., VENCES, M., DUBOIS, A., OHLER, A. & BÖHME, W., 2001. – Out of Asia: mitochondrial DNA evidence for an Oriental origin of tiger frogs, genus *Hoplobatrachus*. *Mol. Phylog. Evol.*, **21** (3): 398-407.
- MEEGASKUMBURA, M., BOSSUTT, F., PETHIYAGODA, R., MANAMENDRA-ARACHCHI, K., BAHIR, M., MILINKOVITCH, M. C. & SCHNIDER, C. J., 2002a. – Sri Lanka: an amphibian hot spot. *Science*, **298**: 379.
- MEEGASKUMBURA, M., PETHIYAGODA, R., MANAMENDRA-ARACHCHI, K., BOSSUTT, F. & SCHNEIDER, C. J., 2002b. – Discovery of a remarkable radiation of direct-developing frogs in Sri Lanka. *Frog Leg.*, **10**: 12.
- MITCHELL, J. C. & ZUG, G. R., 1995. – Keys to the known amphibians and reptiles of the Royal Chitawan National Park, Nepal. *Smithsonian herpetological Information Service*, **106**: 1-15.
- OHLER, A. & DUBOIS, A., 1999. – The identity of *Elachyglossa gyldenstolpei* Andersson, 1916 (Amphibia, Ranidae), with comments on some aspects of statistical support to taxonomy. *Zoologica Scripta*, **28** (3-4): 269-279.
- OHLER, A. & MALLICK, P. K., 2002. – *Rana* (*Hylorana*) sensu Dubois (1992) in India and the identity of *Hylorana tyleri* Theobald, 1868. *Hamadryad*, **27**: 62-70.
- PENNISI, E., 2002. – 100 frogs a-leaping for biodiversity. *Science*, **298**: 339-341.
- PETHIYAGODA, R. & MANAMENDRA-ARACHCHI, K., 1998. – Evaluating Sri Lanka's amphibian diversity. *Occ. Pap. Wildlife Heritage Trust*, **2**: 1-12.
- VEITH, M., KOSUCH, J., OHLER, A. & DUBOIS, A., 2001. – Systematics of *Fejervarya limnocharis* (Gravenhorst, 1829) (Amphibia, Anura, Ranidae) and related species. 2. Morphological and molecular variation in frogs from the Greater Sunda Islands (Sumatra, Java, Borneo) with the definition of two species. *Alytes*, **19** (1): 5-28.

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